REMARKS

Claims 1, 3-5, 7, 9 and 10 are pending in this application. By this Amendment, claim 1 is amended, and claims 2, 6 and 8 are canceled. Claim 1 is amended to further distinguish over the references cited in the Office Action.

No new matter is added to the application by this Amendment. Support for the language added to claim 1 can be found in original claim 2.

I. Claim Rejections Under 35 U.S.C. §103(a)

A. EP 0799901

Claims 1-3, 5, 8 and 9 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over EP 0799901 (EP '901). This rejection is respectfully traversed.

Claim 2 is canceled. Thus, this rejection is moot with respect to claim 2.

The Patent Office alleges that EP '901 discloses the features including the claimed Mg based alloy compositions and Ca/Al ratio. Applicants respectfully disagree.

Nowhere does EP '901 teach or suggest a heat resistant magnesium die casting alloy consisting essentially of Al over 6% to not more than 10% by weight, Ca over 2% to 5% by weight and the Ca/Al ratio of the Ca content to the Al content being 0.3 to 0.5, as required by claim 1.

EP '901 teaches that when a magnesium alloy has aluminum in an amount that exceeds 6% by weight, the magnesium alloy will exhibit a lowered elongation than a magnesium alloy that has aluminum in an amount that does not exceed 6% by weight. See page 2, lines 53 and 54 of EP '901. Further, EP '901 also teaches that to obtain the desired effect of a higher elongation, the amount of aluminum within the alloy should be limited to not exceed 6% by weight. See page 2, lines 55 and 56 of EP '901. Thus, EP '901 teaches away from an alloy having Al in amounts of 6% to not more than 10% by weight, as required by claim 1.

One of ordinary skill of the art would have been led away from an alloy having Al over 6% by weight in view of the teaching of EP '901. Thus, one of ordinary skill in the art would not have looked to the teachings of EP '901 to develop an alloy having the required amounts of Al as rectied in claim 1.

Further, in order to achieve an alloy having Al of over 6% to not more than 10% by weight in the EP '901 composition, as required by claim 1 of the present application, the % by weight of Ca for an alloy according to EP '901 would have to be significantly increased to maintain the Ca/Al ratio as taught in EP '901. As a result, the % by weight of Ca in an alloy having Al of over 6% to not more than 10% by weight, would be significantly greater than 5% by weight, which is the upper limit for the amount of Ca as recited in claim 1.

Moreover, to achieve a Ca/Al ratio of 0.3 to 0.5 as recited in claim 1 in view of the teachings of EP '901, the amounts of Al and/or Ca in the EP '901 composition would be outside the required ranges of claim 1. As illustrated in Example 6 in Table 1 of EP '901, the Ca/Al ratio is 0.4925 (which is within the recited range), but the amount of Al is 4.02 wt.% and the amount of Ca is 1.98 wt.%, which are both outside the ranges for Al and Ca, respectively, as recited in claim 1. Thus, the teachings of EP '901 fail to teach or suggest an alloy capable of satisfying the amount Al and Ca, <u>and</u> achieving the Ca/Al ratio as required in claim 1.

Because these features of independent claim 1 are not taught or suggested by EP '901, the teachings of EP '901 do not render the features of claim 1 obvious to one of ordinary skill in the art.

For at least these reasons, claims 1, 3, 5 and 9 are patentable over JP '901. Thus, reconsideration and withdrawal of the rejection under 35 U.S.C. §103(a) are respectfully requested.

B. <u>Nussbaum et al., EP '531 or EP '743</u>

Claims 1-3, 5, 8 and 9 are rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over U.S. Patent No. 5,147,603 to Nussbaum et al., EP 1308531 (EP '531) or EP 1048743 (EP '743). This rejection is respectfully traversed.

Claims 2 and 8 are canceled. Thus, these rejections are moot with respect to claims 2 and 8.

The Patent Office alleges that Nussbaum et al., EP '531 or EP '743 teaches or suggests each feature recited in claims 1, 2, 5, 8 and 9. Applicants respectfully disagree.

Applicants take this opportunity to provide an overview of the heat resistant magnesium casting alloy, and the distinguishing features thereof, as recited in the present claims.

A magnesium die casting alloy with an Al content over 6% to not more than 10% by weight of the alloy, as recited in the present claims, and with the recited range of Ca/Al ratio, increases the room temperature and high temperature strength over the conventional limit to secure a good castability. See page 4, lines 6-10 of the specification. If the Al content is greater than 10% by weight, regardless of the Ca/Al ratio, the creep resistance (high temperature retained bolt load) drops. See page 4, lines 11-14 of the specification.

By limiting the Ca/Al ratio to 0.3 to 0.5 as recited in claim 1, it is possible to increase the Al content and the Ca content without causing a drop in the creep resistance due to the higher Al content or a deterioration of the castability due to the higher Ca content, and it is therefore possible to further raise the high temperature strength and creep resistance and secure good castability. See page 4, line 33 – page 5, line 3 of the specification. Additionally, to stably secure a high creep resistance, the Ca/Al ratio must be at least 0.3 (page 5, lines 3-5 of the specification), and to stably suppress the occurrence of hot-cracking

during die casting, the Ca/Al ratio must be not more than 0.5 (page 5, lines 5-8 of the specification).

As illustrated in Tables 1-3 of the specification, magnesium alloys that satisfy the ranges of the Ca content, the Al content and the Ca/Al ratio exhibit superior proof strength, tensile strength, retained rate after 300 h when compared to alloys that fail to satisfy those ranges. Table 1 shows that Alloy Nos. 23-27 have an Al content over 6% to not more than 10% by weight and a Ca content over 2% to 5% by weight as recited in claim 1. However, only Alloy Nos. 25-27 also satisfy the Ca/Al ratio being 0.3 to 0.5 as required in claim 1. Alloy Nos. 25-27 have greater proof strength, tensile strength and retained rate after 300 h than Alloy Nos. 23 and 24 (see Tables 2 and 3). Thus, alloys satisfying all of the ranges for Ca content, Al content and Ca/Al ratio, as set forth in claim 1, have superior physical characteristics than alloys that satisfy ranges for Ca content and Al content and fail to satisfy the range for Ca/Al ratio.

In the recited magnesium alloy of claim 1, the corrosion resistance of the alloy is improved as Al content is increased. The following data shows the corrosion resistance for the alloy samples of Table 1 in the specification.

Corrosion Data (Samples from Table 1 in the specification)

No.	Name	Al Content (wt%)	Corrosion Rate ($mg/cm^2/day$)
2	M310203	2.95	3.42
6	M320501	3.09	3.83
13	MS20106	5.34	1.33
15	MS20503	5.12	1.16
21	M710503	7.08	0.41
24	M720506	7.33	0.106

Example Nos. 2, 6, 13 and 15 are comparative examples because the Al content of each example is less than 6% by weight. This data set illustrates that the corrosion resistance

of the magnesium alloy samples is improved as the Al content in the alloy samples is increased.

1. Nussbaum et al.

Nowhere does Nussbaum et al. teach or suggest a heat resistant magnesium die casting alloy consisting essentially of, by wt%, the following composition: Al: over 6% to not more than 10%, Ca: over 2% to 5%, and the Ca/Al ratio of the Ca content to the Al content being 0.3 to 0.5, as required in claim 1.

Contrary to the allegations by the Patent Office, Nussbaum et al. fails to teach or suggest (1) the recited Ca/Al ratio of the magnesium alloy of claim 1, and (2) an alloy satisfying the recited ranges for Ca content, Al content and Ca/Al ratio. As discussed above, such amounts of Ca and Al, and the recited Ca/Al ratio, produce superior physical characteristics in an alloy.

As shown in Table 1 of Nussbaum et al., none of the test alloys have both Ca and Al amounts within the recited ranges of claim 1 <u>and</u> the recited Ca/Al ratio of claim 1. Further, Test nos. 30-32, 34 and 35 of Nussbaum et al. do not contain any Ca, which is not within the required range for Ca content of claim 1. Only Test nos. 9, 12 and 33 of Nussbaum et al. contain both Al and Ca. However, none of Test nos. 9, 12 and 33 of Nussbaum et al. have a Ca content that is within the recited range of claim 1, an Al content that is within the recited range of claim 1 <u>and</u> a Ca/Al ratio within the recited range of claim 1. Thus, Nussbaum et al. does not teach or suggest the recited Ca amount, the recited Al amount <u>and</u> the recited Ca/Al ratio, as required in the present claims.

At best, Nussbaum et al. provides a general teaching, but Nussbaum et al. does not teach or suggest the specific amounts and ratio of claim 1.

Further, Table 2 of Nussbaum et al. illustrates the resistance to corrosion for the Test nos. 9 (Mg, 5% wt. Al, 3.7% wt. Ca), 30 (Mg, 9% wt. Al, 1% wt. Sr) and

36 (Mg, 10% wt. Al, 5% wt. Sr). As set forth in Table 2, a test alloy, such as Test no. 9 having both Ca and Al, but having an Al content not within the range recited in claim 1, exhibits poor resistance to corrosion properties when compared to the Test alloys, such as Test nos. 30 and 36, which do not contain any Ca. Thus, based on the results in Table 2, Nussbaum et al. teaches that alloys having Ca and Al (Test nos. 9) as recited in the present claims are not as desired as alloys that do not have <u>both</u> Ca and Al (Test no. 30 and 36) provide good resistance to corrosion. See col. 5, lines 48-51.

As shown from the data above, the recited magnesium alloy of claim 1 exhibits improved corrosion resistance wherein the Al content is increased, the alloy contains Ca within the range recited in claim 1, and the alloy has a Ca/Al ratio within the range recited in claim 1. Thus, Applicants submit that the data provided herein along with the teachings of Nussbaum et al. illustrate that the recited ranges for Ca and Al content and the Ca/Al ratio of claim 1 are not taught or suggested by Nussbaum et al.

Because these features of independent claim 1 are not taught or suggested by Nussbaum et al., the teachings of Nussbaum et al. do not render the features of claim 1 obvious to one of ordinary skill in the art.

For at least these reasons, claims 1, 3, 5 and 9 are patentable over Nussbaum et al.

2. <u>EP '531</u>

Nowhere does EP '531 teach or suggest a heat resistant magnesium die casting alloy <u>consisting essentially of</u>, by wt%, the following composition: Al: over 6% to not more than 10%, Ca: over 2% to 5%, and the Ca/Al ratio of the Ca content to the Al content being 0.3 to 0.5 as required in claim 1.

The alloy composition of EP '531 contains 0.3 to 2.2% by weight of Sn as an indispensable alloying element for improving casting property of an alloy composition. See paragraph [0024] and Examples 1-14 in Table 2 of EP '531. However, the recited alloy

consists essentially of Al, Ca, Sr, Mn, Mg and unavoidable impurities. Inclusion of Sn as taught by EP '531 into the alloy of claim 1 would materially affect the basic and novel characteristics, such as the above-discussed advantageous properties of the magnesium alloy.

Because EP '531 teaches that tin is an indispensable alloying element and claim 1 does not include tin, the teachings of EP '531 do not render the features of claim 1 obvious to one of ordinary skill in the art.

For at least these reasons, claims 1, 3, 5 and 9 are patentable over EP '531.

3. <u>EP '743</u>

Nowhere does EP '743 teach or suggest a heat resistant magnesium die casting alloy consisting essentially of, by wt%, the following composition: Al: over 6% to not more than 10% and the Ca/Al ratio of the Ca content to the Al content being 0.3 to 0.5 as required in claim 1.

To avoid degradation of a creep resistance of the alloy of claim 1, the alloy of claim 1 requires an Al content of over 6% to not more than 10% by weight and a Ca/Al ratio of 0.3 to 0.5. See Alloy Nos. 25-27 in Tables 2 and 3 of the specification. Additionally, the recited Al content and the Ca/Al ratio simultaneously improves both the creep resistance and the casting property of the alloy of claim 1 as discussed above.

EP '743 teaches an alloy containing between 3% and 6% aluminum (see Abstract of EP '743). The Al content taught by EP '743 fails to satisfy the recited Al content of over 6% to not more than 10% by weight as set forth in claim 1. Thus, the alloy composition of EP '743 fails to teach or suggest an alloy that satisfies the recited Al content as required in claim 1.

Because these features of independent claim 1 are not taught or suggested by EP '743, the teachings of EP '743 do not render the features of claim 1 obvious to one of ordinary skill in the art.

For at least these reasons, claims 1, 3, 5 and 9 are patentable over EP '743.

Accordingly, reconsideration and withdrawal of these rejections are respectfully requested.

C. **EP '950 or JP '348**

Claims 1-10 are rejected under 35 U.S.C. §103(a) as being unpatentable over EP 1127950 (EP '950) or JP 06-200348 (JP '348). This rejection is respectfully traversed.

Claims 2 and 8 are canceled. Thus, these rejections are moot with respect to claims 2 and 8.

1. **EP '950**

Nowhere does EP '950 teach or suggest a heat resistant magnesium die casting alloy consisting essentially of, by wt%, the following composition: Al: over 6% to not more than 10% and the Ca/Al ratio of the Ca content to the Al content being 0.3 to 0.5 as required in claim 1.

As the Al content increases in the recited alloy of claim 1, the alloy exhibits an increased corrosion resistance as illustrated in the data herein. As discussed above, the Ca/Al ratio in the alloy of claim 1 is maintained within the recited range to avoid degradation of the creep resistance by simultaneously improving the creep resistance and the casting property of the alloy of claim 1.

EP '950 teaches a die casting magnesium alloy comprising 2% to 6% by weight of Al (see Abstract of EP '950). EP '950 teaches that increasing the Al content beyond 6% by weight in the alloy without maintaining a specific Ca/Al ratio causes degradation of the creep resistance for the alloy. See paragraphs [0045]-[0048] of EP '950. EP '950 fails to disclose the Ca/Al ratio being 0.3 to 0.5 as recited in claim 1 prevents this degradation of the creep resistance of the alloy. Thus, EP '950 fails to teach an Al content over 6% to not more than 10%, as recited in claim 1.

Because the features of independent claim 1 are not taught or suggested by EP '950, the teachings of EP '950 do not render the features of claim 1 obvious to one of ordinary skill in the art. For at least these reasons, claims 1, 3-5, 7, 9 and 10 are patentable over EP '950.

2. JP '348

Nowhere does JP '348 teach or suggest a heat resistant magnesium die casting alloy consisting essentially of Al over 6% to not more than 10% by weight, Ca over 2% to 5% by weight and the Ca/Al ratio of the Ca content to the Al content being 0.3 to 0.5, as required by claim 1.

Examples 1-13 in Table 1 of JP '348 fail to teach or suggest an alloy having a Ca content over 2% to 5% by weight and an Al content over 6% to not more than 10% as required in claim 1. Moreover, none of the teachings of JP '348 provide an alloy that satisfies the recited ranges of Al content and Ca content, and the recited Ca/Al ratio of claim 1.

As discussed above, the recited magnesium die casting alloy of claim 1 exhibits superior properties over alloys that fail to satisfy the ranges recited in claim. These advantages include an increase in the room temperature and high temperature strength over the conventional limit to secure a good castability, without causing a drop in the creep resistance or a deterioration of the castability. Since the composition of JP '348 fails to satisfy the required ranges of claim 1, these advantages will not be exhibited in the composition as taught by JP '348.

Thus, JP '348 fails to teach or suggest an alloy that satisfies the recited content of Al and Ca and the recited Ca/Al ratio of claim 1.

Because the features of independent claim 1 are not taught or suggested by JP '348, the teachings of JP '348 do not render the features of claim 1 obvious to one of ordinary skill in the art.

For at least these reasons, claims 1, 3-5, 7, 9 and 10 are patentable over JP '348. Accordingly, reconsideration and withdrawal of these rejections are respectfully requested.

II. Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1 and 3-5, 7, 9 and 10 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

Brian C. Anscomb

James A. Oliff
Registration No. 27,075

Brian C. Anscomb
Registration No. 48,641

JAO:BCA/hs

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OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

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